Section-C **(15x1=15)**

16. Expand $f(x) = x$ as half range
    (i) Sine series in $0 < x < 2$
    (ii) Cosine series in $0 < x < 2$

17. Solve the following differential equation:
    $(D^2 - 4D + 4)y = 8x^2 e^{2x} sin2x$

18. Discuss the convergence of the series
    $$x + \frac{2^2x^2}{2!} + \frac{3^3x^3}{3!} + \frac{4^4x^4}{4!} + \frac{5^5x^5}{5!} + \cdots \infty$$

Roll No.................

BCA-405(N)

B. C. A. (Semester-IV) Exam. -2014
(New Course)
Paper: Fifth
Mathematics-III

Time: Three Hours] [Maximum Marks: 75

Note: Section A compulsory. Attempt any ten questions out of thirteen questions from Section B and one question from Section C.

Section-A **(10x2=20)**

1. (i) Find the complete solution of
   $$\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = xe^{3x} + \sin 2x$$
   (ii) Solve the differential equation by using method of undetermined coefficient
   $$(D^3 - 2D^2 + D - 2)y = 5cos2x - 6x^2$$

2. (i) Test for convergence the series
   $$\frac{1}{2\sqrt{1}} + \frac{x^2}{3\sqrt{2}} + \frac{x^4}{4\sqrt{3}} + \frac{x^6}{5\sqrt{4}} + \dots\dots \infty$$
   (ii) $1 + \frac{2!}{2^2} + \frac{3!}{3^3} + \frac{4!}{4^4} + \cdots \infty$

Section-B ....(4x10=40)

3. Find all the values of $\left(\frac{1}{2}+\frac{\sqrt{3}\,i}{2}\right)^{3/4}$

4. Discuss the nature of the following series:
$\sum \frac{(n+1)^n x^n}{x^{n+1}}$

5. What is the directional derivative of $\phi = xy^2 + yz^3$ at the point (2,-1,1) in the direction of the normal to the surface x $logz - y^2 = -4$ at (-1,2,1)?

6. Expand $\pi x - x^2$ in a half-range sine series in the interval $(0, \pi)$ up to the first three terms.

7. Solve $\left(y^2 e^{xy^2} + yx^3\right)dx + \left(2xye^{xy^2} - 3y^2\right)dy = 0$

8. Solve $xy(1 + xy^2)\frac{dy}{dx} = 1$

9. Solve $x^3\frac{d^3y}{dx^3} + 3x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = x + logx$

10. Find the complete solution of $(D^2 + a^2)y = secax$

11. Examine for convergence of the series
(i) $1 + 2 + 3 + \cdots + n + \cdots + \infty$
(ii) $5 - 4 - 1 + 5 - 4 - 1 + 5 - 4 - 1 + \cdots \infty$

12. Obtain Fourier series for the function $f(x)$ given by
$$f(x) = \begin{cases} 1 + \frac{2x}{\pi}, -\pi \le x \le 0 \\ 1 - \frac{2x}{\pi}, 0 \le x \le \pi \end{cases}$$
Hence deduce that
$$\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots = \frac{\pi^2}{8}$$

13. Separate $\tan^{-1}(x + iy)$ into real and imaginary parts.

14. A particle moves along the curve $R = (t^3 - 4t)I + (t^2 + 4t)J + (8t^2 - 3t^3)K$
Where t denotes time. Find the magnitudes of acceleration along the tangent and normal at time t=2.

15. Evaluate:
(i) $div[3x^2 I + 5xy^2 J + xyz^3 k]$ at the point (1, 2, 3)
(ii) Curl $[e^{xyz}(I + J + K)]$